CHLORIDE

Secure Power Always

Trinergy from 200 to 1200 kVA

UPS Catalogue

Important note!

The technical data enclosed is for general information. Please note that the operating instructions and references indicated on the products are for installation, operation and maintenance.

Product designations

All product designations used are trademarks or product names of Chloride Group PLC or its subsidiary companies.

This publication is issued to provide outline information and is not deemed to form any part of any offer or contract. The company has a policy of continuous product development and improvement and we therefore reserve the right to vary any information quoted without prior notice.

Person to contact

Uninterruptible Power Supply Systems

UPS Catalogue • 2009

Trinergy from 200 to 1200 kVA

1 Scope

This specification describes a continuous duty three-phase, solid state, full IGBT (Insulated Gate Bipolar Transistor), double conversion uninterruptible power supply (UPS) system. The UPS will automatically provide continuity of electrical power, within defined limits and without interruption, upon failure or degradation of the commercial AC source.

The continuity of conditioned electric power will be delivered for the time period defined by the battery system.

The rectifier, the inverter, and other mission critical converters within the UPS, are driven by vector control algorithms (covered by patents 95 P3875, 95 P3879 and 96 P3198) running on dedicated digital signal processor (DSP) systems operating in combination with the Trinergy algorithm.

2 General requirements

2.1 Applied standards

Chloride operates a Quality Management System which complies with BS EN ISO 9001-2000 for the design, manufacturing, sales, installation, maintenance and service of uninterruptible power supply systems. The Chloride Environmental Policy and Management Systems comply with EN ISO 14 001. Chloride is also committed to implementing a policy of continuous improvement to its production processes and pollution reduction. Trinergy will carry the CE mark in accordance with the European Safety Directive 2006/95 (superseding the 73/23 and successive amendments) and European EMC directive 2004/108 (superseding the 89/336, 92/31 and 93/68). Trinergy is designed and manufactured in accordance with the following international standards:

- IEC/EN62040-1-1 general and safety requirements
- EN62040-2 EMC requirements
- IEC/EN62040-3 operating requirements
- Classification according to IEC/EN 62040-3: VFI-SS-111

2.2 Safety

In terms of general and safety requirements, the UPS conforms to standard IEC/EN 62040-1-1 governing use in unrestricted access locations.

2.3 EMC and surge suppression

Electromagnetic effects will be minimised in order to ensure that computer systems and other similar electronic loads will neither be adversely affected by nor affect the UPS. The UPS will be designed to meet the requirements of EN 62040-2, class C3. The manufacturer and customer in partnership agree to ensure the essential EMC protection requirements for the specific resulting installation.

2.4 Neutral connection and grounding

Trinergy output neutral will be electrically isolated from the UPS chassis. The input and output neutral connections are the same, i.e. they are solidly tied together. Therefore the UPS will not modify the state of the upstream neutral, in any operating mode, and the neutral state of the distribution downstream from the UPS is imposed by the mains one. Trinergy will be used in installations with grounded neutral; for further details please contact Chloride Technical Support.

2.5 Materials

All materials and components comprising the UPS will be new and of current manufacture.

3 System description

3.1 The system

The UPS will provide high quality AC power for electronic equipment loads and will offer the following features:

- Trinergy technology
- Maximum energy savings
- Scalability up to 9.6 MW
- Increased power quality
- Full input Power Factor Correction (PFC) and very low THDi
- Full compatibility with any TN and IT installation
- Full compatibility with any standby power generator
- Full compatibility with all types of loads with PF up to 1 without derating
- Power blackout protection
- Advanced battery care
- Transformer free design

The UPS will automatically provide continuity of electrical power, within defined limits and without interruption, upon failure or degradation of the commercial AC source.

In a single UPS Trinergy can provide a parallel of up to six power modules operating in parallel for capacity or redundancy.

3 System description

3.2 Models available

Trinergy is a high power modular UPS and is made up of one central I/O Box with a total of up to six power modules connected to it. Trinergy can be customised from 200 kVA up to 1.2 MVA in one single system.

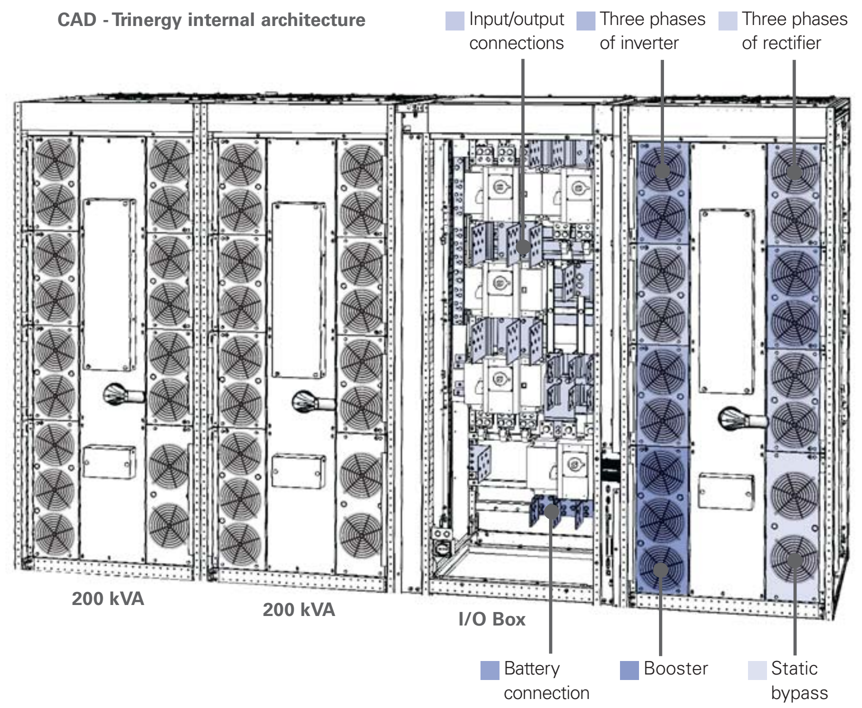

Figure 1. Trinergy CAD model.

The following configurations are available as standard while for all the other configurations it is possible to separately purchase the I/O Box, power modules and connection kit.

Model	Rating (kVA)	I/O Box (kVA)	N° of Power Modules
Trinergy	400	400	2
Trinergy	600	800	3
Trinergy	800	800	4
Trinergy	1000	1200	5
Trinergy	1200	1200	6

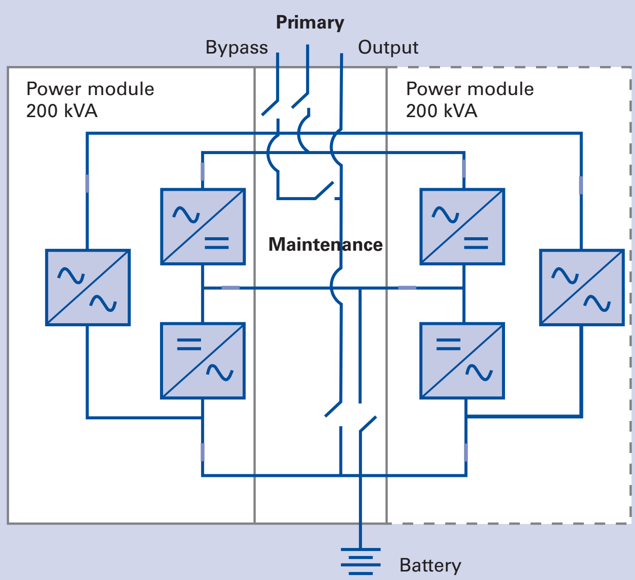

Figure 2. Trinergy 400 kVA single-line diagram.

3 System description

3.3 I/O Box

The central I/O Box is a common interface for power connection and user interaction.

The central I/O Box is available in three different ratings: 400 kVA, 800 kVA and 1200 kVA. A maximum of two, four or six 200 kVA power modules can be connected to the I/O Box, depending on its rating. The modular architecture of Trinergy allows power modules to be added without the need for any modification to the current installation.

The following switches are located on the front of this box:

- Bypass
- Input
- Output
- Maintenance bypass
- Battery

This allows any maintenance work to be carried out without disconnecting the load. Input and output terminals, as well as the battery connection are located in the central I/O Box which allows for top or bottom cable entry.

It will be possible to implement a manual uninterrupted bypass of the complete system in order to enable maintenance work to be carried out on the system. The bypass supply will continue to feed the load. In this case the UPS will be voltage-free as it will be disconnected from the supply networks. In this case, maintenance work on the UPS can be carried out without affecting the connected electric load.

Batteries can be either centralised or distributed with connection always being from the I/O Box. If the battery is taken out of service for maintenance, it must be disconnected from the UPS by means of an external switch (e.g. situated in the battery cabinet). The UPS will continue to operate and meet the performance criteria specified with the exception of the battery backup time.

The central I/O Box houses a 12.1 inch LCD touch screen which allows for easy monitoring of the system and individual modules. Using the touch screen it is also possible to access the service history log for faster, simpler maintenance. Single point of failure is completely eliminated as all the power components, as well as the control boards, are present in each power module.

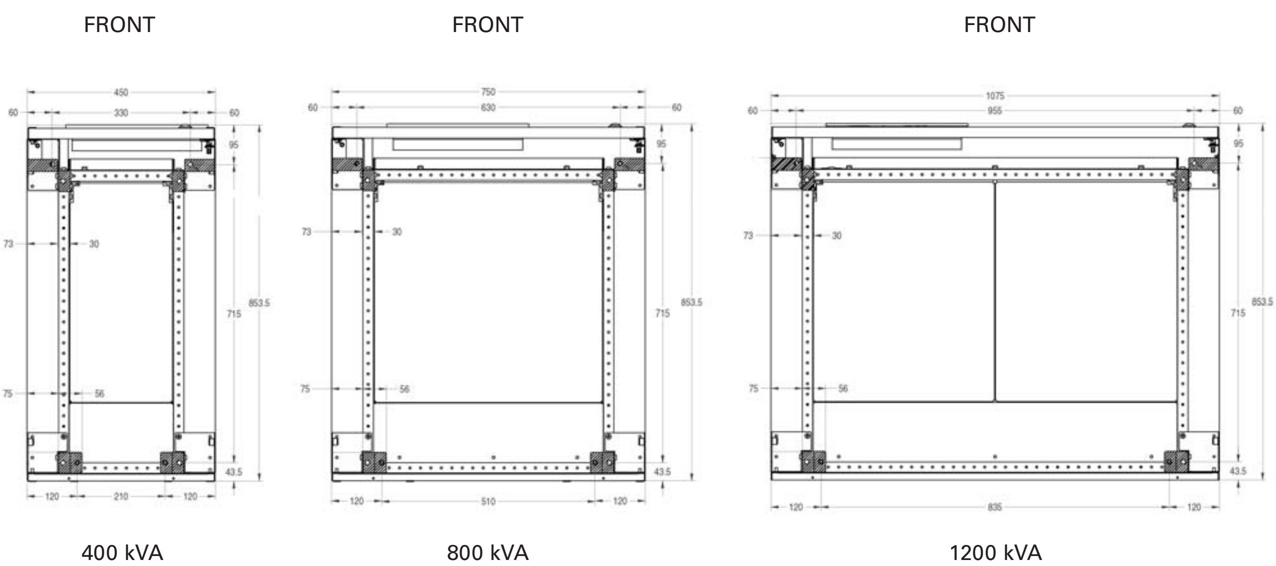

Figure 3. Trinergy I/O Box footprint.

3 System description

3.4 Power Modules

Each of the Trinergy power modules has eight separate drawers which allow for improved serviceability of the individual power modules. The power module contains:

- Full IGBT rectifier,
- IGBT Booster/battery charger
- IGBT inverter
- Power interface/Static Bypass
- Power control

Each power module will be fitted with the following switches:

- Input
- Output
- Battery
- Neutral

These switches will make it possible to completely isolate a single power module for maintenance or service operation. As a result, there will be no interruption to the power of the critical load when it is necessary to take a power module out of service for maintenance or repair. Isolation will be complete and all serviceable components such as fuses, internal power functional modules etc will be isolated.

Remaining power modules will continue to power the load making it possible to perform maintenance operation on the system while maintaining the highest level of power protection and avoiding the need to switch the whole system to manual maintenance bypass.

3.5 Microprocessor control and diagnostics

Operation and control of the UPS will be provided through the use of micro-processor-controlled logic. Indications, measurements and alarms, together with battery autonomy, will be shown on a graphic LCD touch screen display. The procedures for start up, shutdown and manual transfer of the load to and from bypass will be explained in clear step-by-step sequences on the LCD display.

3.6 Control and diagnostics

Control of the electronic power modules will be optimised in order to provide:

- Optimum three-phase supply and conditioning of the load
- Controlled battery charging
- Minimum effects upon the supply network

Trinergy houses an advanced digital control platform that combines the advantages of a double DSP which executes all the vector control algorithms and the Microcontroller which gives maximum communication flexibility whilst interfacing all internal and external signals. Thanks to this platform Trinergy will achieve the most powerful control in the UPS industry.

3.6.1 Vector control & Trinergy algorithm

To ensure the quick and flexible processing of measuring data, special arithmetic algorithms will be implemented in DSP, rapidly generating controlled variables as a result. This will thus render possible the real-time control of the inverter electronics, resulting in obvious advantages in the performance of the power components. These advantages will be:

- Improvement of short circuit behaviour, as individual phases can be controlled faster
- Synchronism or phase angle precision between UPS output and bypass supply even in the case of a distorted mains voltage
- High flexibility in parallel operation: parallel Trinergy systems may be housed in separate rooms.

Several algorithms included in the vector control firmware are covered by patents owned by Chloride (95 P3875, 95 P3879 and 96 P3198).

The precise control of Trinergy allows it to quickly and seamlessly activate one of the three different functioning modes of the UPS in order to accomplish the efficiency and effectiveness of each of the standard configurations. At the same time, Trinergy continues to maintain the performance and power protection of a Class 1 (IEC 62040-3) UPS for the load and perfect input power conditioning for the upstream distribution.

3.6.2 Preventive monitoring

In order to maximise the reliability of the system, the control unit will monitor a wide number of operating parameters for the rectifier, inverter and battery. All vital operating parameters, such as temperatures, frequency and voltage stability at the system input and output, load parameters and internal system values will be constantly monitored and controlled for irregularities. The system will react automatically before a critical situation arises either for the UPS or the load, in order to ensure the supply of the load even in these difficult conditions.

3.6.3 Telediagnosis and telemonitoring

In all the above modes of operation, the UPS may be monitored and controlled from a remote location such as a service centre, in order to maintain system reliability at nominal levels. Even during complete shutdown of the UPS, information relating to the operating parameters will not be lost thanks to non volatile FRAM which will store the information for up to 45 years.

3 System description

3.6.4 Serviceability and commissioning

Trinergy is designed for easy installation and serviceability thanks to the drawer design, making it a full modular service solution and considerably minimising the time needed for repairs. All functional modules can be removed by extracting the drawers from the front of machine. Each UPS will be equipped with ID card, including all main UPS working parameters. This card, reduces the MDT shortening service and commissioning operations.

3.7 Parallel Configuration

3.7.1 Paralleling principle

The Trinergy series of uninterruptible power supply systems will be connectable in parallel for multi-module configurations. The maximum number of power modules that can be connected to the I/O Box is six, providing 1.2 MW of power in one single Trinergy UPS. The maximum number of Trinergy UPS possible in parallel configuration is eight. The parallel connection of UPS will increase reliability and power.

Reliability
If the installation requires a redundant configuration the power of each UPS should not be lower than Ptot/(N-1) where:

P_{tot} = Total load power
N = Number of Power Modules in parallel
1 = Minimum coefficient of redundancy

Under normal operating conditions, the power delivered to the load will be shared between the number of power modules connected to the parallel bus.

In case of overload the configuration may deliver P_{ov} x N without transferring the load onto the reserve, where:

P_{ov} = Max overload power of a single UPS
N = Number of UPS units in parallel

In the event of failure by one of the power modules, the faulty module will be completely isolated and the load will be supplied from the remaining units without any break in supply continuity. Internal redundancy allows maintenance to be carried out on specific modules while other modules continue to provide full protection to the load with enormous advantages on the availability of the whole system.

A maximum of eight Trinergy UPS may be connected in parallel.

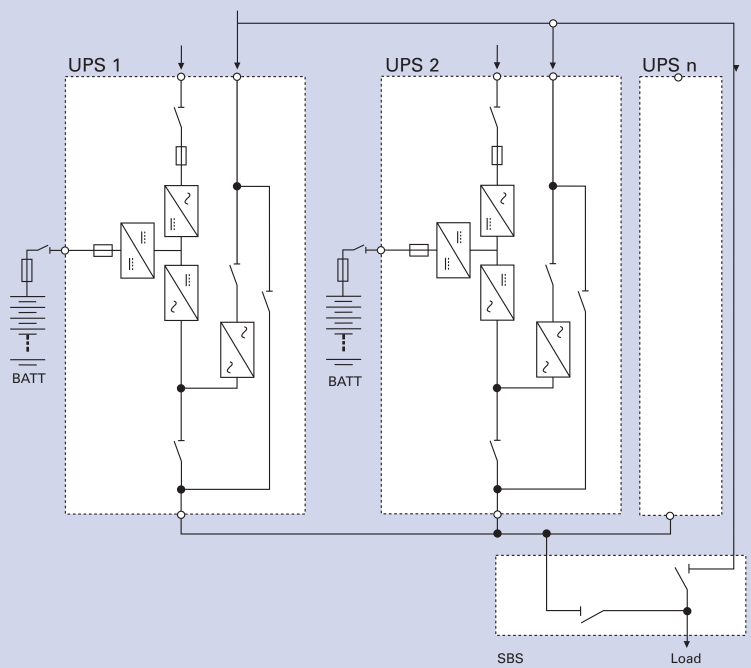

Figure 4. Trinergy parallel systems.

3 System description

3.7.2 Modular Parallel

The Trinergy UPS will be capable of operating in a modular parallel configuration.

The parallel option will simply consist of screened data cables connected to the neighboring UPS systems (closed loop ring bus).

A multi-module system will be controlled and monitored automatically by controlling the individual UPS modules. The parallel system control is distributed among the units (no master/slave architecture). The bypass lines and inverters included in each UPS share the load. The load sharing among the UPS parallel system ("load on inverter" mode) will be achieved with a tolerance of less than 3% at nominal load.
The loop ring bus will allow the parallel to share the system load even with an interruption in the data cable (first failure proof system).

3.7.3 Circular Redundancy

Circular redundancy is able to optimise the efficiency of the UPS even at low partial loads. In the case that the total number of power module is not necessary to power the output load, Trinergy will evaluate the real number of power modules required (maintaining also the level of redundancy requested) to power the actual load. As soon as an increase of the load is verified the power modules will be started up.

The main objective of “circular redundancy” is to power on only the minimum number of inverters required at that level of load, ensuring a periodic turnover of all the available modules (cores). This ensures that the highest level of efficiency is maintained at all times.

4 AC/DC IGBT Converter (Rectifier)

4.1 Primary input

The three-phase current taken from the commercial AC source will be converted to a regulated DC voltage by an IGBT rectifier. In order to protect the power components within the system each phase of the rectifier input will be individually fitted with a fast-acting fuse. As shown in Figure 1, the IGBT rectifier will provide DC power to the DC/AC output converter (IGBT inverter) and to the DC/DC battery converter (booster/battery charger) when the latter is working in battery charger mode.

4.2 Total Input Harmonic Distortion (THD) and Power Factor (PF)

The maximum voltage THD (THDV) permitted on the rectifier input (either from the utility or generator) will be 15% (normal operation is guaranteed up to 8%). The maximum current THD injected into the mains (THDI) will be less than 3% at maximum input power and input voltage THDV < 1% (nominal input voltage and current). Under these conditions the input power factor (PF) will be > 0.99. Under other input conditions and with other output load fractions the THDI will be < 5%. This means that the Trinergy, in double conversion mode, will be seen by the primary mains sources and distribution as a resistive load (i.e. it will absorb only active power and the current waveform will be practically sinusoidal), thus ensuring total compatibility with any power source.

4.3 Operation with diesel generator

In order to obtain the required THD on input voltage, the coordination between a diesel generator and UPS will be based on the generator’s sub-transient reactance, as opposed to its short-circuit reactance.

4.4 Soft start

With the UPS logic properly powered, after applying the input voltage the rectifier starts an additional programmable current soft start (1-90 seconds). This procedure results in a gradual and soft walk-in of the current taken from the input voltage supply network. This ensures that any standby generator is gradually introduced into the UPS input, as shown in Figure 5.
To avoid the simultaneous start-up of different rectifiers, it is possible to programme a hold-off dedicated start delay (1-180 seconds) for each unit. In addition, the UPS includes an ‘on generator’ function which, when activated via floating contact, provides the possibility of inhibiting either battery charging, synchronisation of the inverter to the direct line supply or transfer to the direct line.
When the UPS is operating with a Flywheel system, the corresponding hold-off and soft start parameters must be set according to the requirements of the genset. Please contact the technical support for more information.

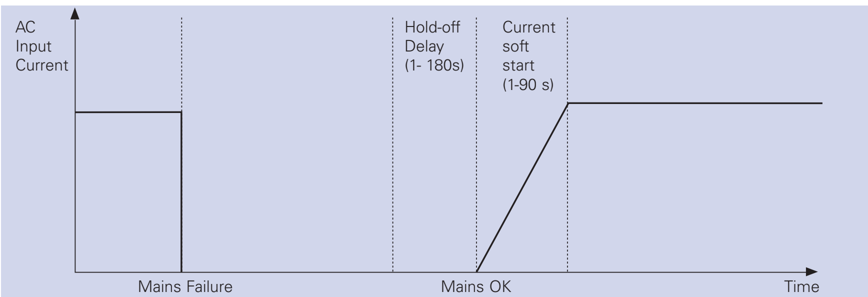

Figure 5. Rectifier soft start.

5 DC/DC IGBT Converter (Booster/Battery Charger)

5.1 Booster/Battery Charger

As seen in Figure 1, this bidirectional IGBT DC/DC converter will have the following functions:

- To recharge the batteries taking the power from the DC bus, when the primary input mains is within the given tolerances
- To provide the suitable full DC power, taken from the batteries, to the IGBT output inverter if the primary mains is unavailable.

5.2 Battery charger mode

This converter will be operable with the following types of batteries:

- Sealed Lead Acid (VRLA)
- Lead Acid
- Ni - Cd

The selection of the optimum charging method will be completely managed by the microprocessor. Several different charging methods are available.

5.3 Voltage regulation, temperature compensation

In order to ensure optimum battery charging, float voltage will be automatically adjusted to the ambient temperature. The IGBT rectifier will be capable of supplying the battery charger with DC voltage at rated power, even if the UPS input AC voltage is below the nominal voltage specified. A further reduction of the input AC voltage (within specified limits which are dependent also on the output power requested by the load) will inhibit the battery charger but will not require the discharging of the batteries. See Figure 6 for details.

5.4 Residual ripple filtering

The battery charger output will have a residual voltage ripple of <1%.

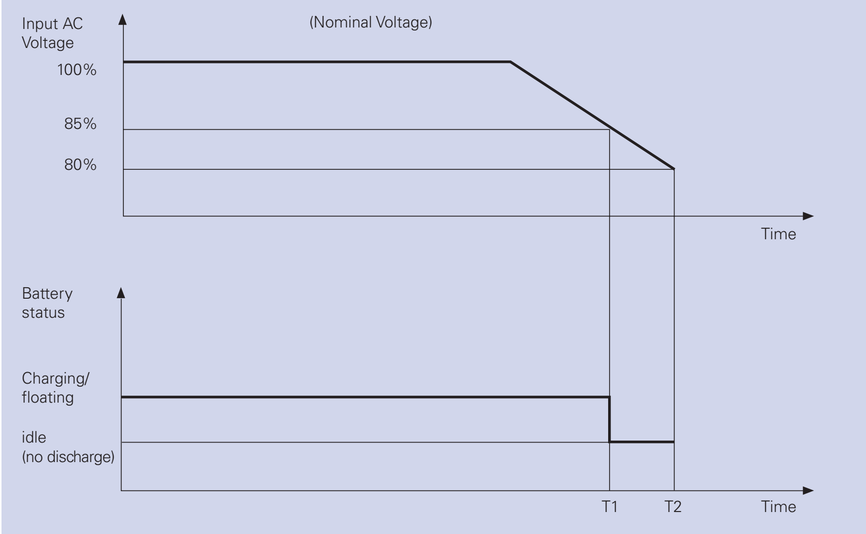

Figure 6. Battery status during reduction of the commercial AC source.

5.5 Capacity and charging characteristics

When the primary mains is not suitable to supply the rectifier, the DC/DC converter (booster mode) will provide the required power to the inverter using the energy stored in the battery.
After the discharge of the battery and when the input AC power is restored, the rectifier will power the inverter and recharge the batteries through the DC/DC converter in battery charger mode. The following charging methods are an example of the several methods available, giving the possibility of matching the following different types of accumulators:

5.5.1 Sealed, maintenance-free lead acid accumulators:

Charging is at constant current up to the maximum floating voltage level. Thereafter the voltage will be kept at a constant level within narrow limits (single-step charging method).

5.5.2 Sealed, low-maintenance lead acid accumulators or NiCd accumulators:

Charging is at increased charging voltage and constant charging current (boost charge phase). When the charging current falls short of a lower threshold value the battery charger will automatically return to floating voltage level (two-step charging method).

5.6 Over voltage protection

The battery charger will automatically switch off if the DC battery voltage exceeds the maximum value associated with its operational status.

5.7 Battery management

Using advanced battery care (ABC) the Trinergy series will maximise battery running time by up to 50%. The main battery care features are described as follows:

5.7.1 Operating parameters

When operating with a maintenance free, valve regulated lead acid battery (VRLA), the parameters per cell will be as follows:

- End of discharge voltage (V) 1.65
- Shutdown imminent alarm (V) 1.75
- Minimum battery test voltage (V) 1.9
- Nominal voltage (V) 2.0
- Battery discharging alarm (V) 2.20 @ 20°C
- Float voltage (V) 2.27 @ 20°C
- High voltage alarm (V) 2.4

5 DC/DC IGBT Converter (Booster/Battery Charger)

5.7.2 Automatic battery test

The operating condition of the batteries will be automatically tested by the control unit at selectable intervals, e.g. weekly, fortnightly or monthly. The battery test can be performed in each of the different functioning modes. A short-time discharge of the battery will be made to confirm that all the battery blocks and connecting elements are in good working order. In order to preclude a faulty diagnosis, the test, at the earliest, will be launched 24 hours after the latest battery discharge. The battery test will be performed without any risk to the load, even if the battery is completely defective. Users will be alerted to a detected battery fault. The battery test will not cause any degradation in terms of the battery system life expectancy.

5.7.3 Ambient temperature compensated battery charger

The float voltage will be automatically adjusted as a function of the temperature in the battery compartment (-0.11% per °C) in order to maximise battery operating life.

5.7.4 Time compensated end of discharge voltage

When the discharge time exceeds one hour, the shutdown voltage will be automatically increased, as shown in Figure 6 for VRLA, to avoid prolonged battery discharge as a result of a light load.

5.7.5 Remaining battery life

Trinergy uses sophisticated algorithms to determine the battery life remaining, based on real operating conditions such as temperature, discharge and charging cycles, and discharge depth.

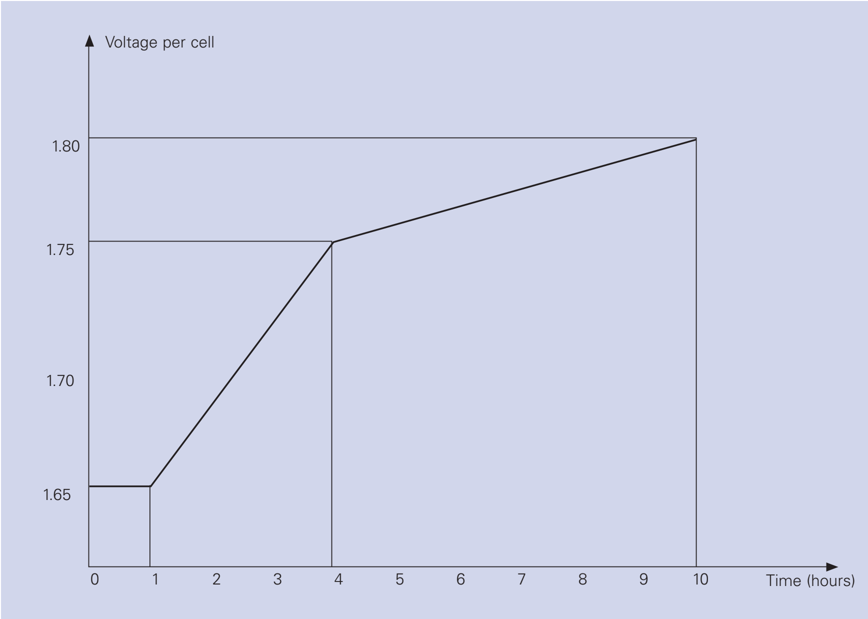

Figure 7. End-of-discharge voltage in relation to discharge time.

6 DC/AC IGBT Converter (Inverter)

6.1 AC voltage generation

From the DC voltage of the intermediate circuit the inverter will generate sinusoidal AC voltage for the user load on the basis of pulse-width modulation (PWM). By means of the digital signal processor (DSP) of the control unit, the IGBT of the inverter will be controlled so that DC voltage is divided up into pulsed voltage packets. Thanks to a low-pass filter, the pulse-width modulated signal will be converted into sinusoidal AC voltage. No isolation transformer is needed for the IGBT inverter, with the great benefits of: energy conversion efficiency and reduction in physical size and weight of the modules.

6.2 Voltage regulation

The inverter output voltage on the three phases will be individually controlled to achieve the following performances:

- The inverter steady state output voltage will not deviate by more than ±1% in a steady state condition for input voltage and load variations within the quoted limits
- The inverter transient voltage will not exceed Class 1 limits when subjected to application or removal of 100% load as defined by IEC/EN62040-3

6.3 Frequency regulation

The inverter output frequency will be controlled to achieve the following performances:

- The inverter steady-state output frequency, when synchronised to bypass supply, will not deviate by more than ±1% adjustable to ±2%, ±3%, ±4%
- The frequency slew rate will be <1 Hz per second
- The output frequency of the inverter will be controlled by a quartz oscillator which can be operated as a free running unit or as a slave for synchronised operation with a separate AC source. The accuracy of the frequency control will be ±0.1% when free-running

6 DC/AC IGBT Converter (Inverter)

6.4 Total Harmonic Distortion

The inverter will provide harmonic neutralisation and filtering to limit the THD on the voltage to less than 1% with a linear load. For reference non-linear load (as defined by IEC/EN62040-3) the THD will be limited to less than 3%.

6.5 Neutral sizing

The sizing of the inverter neutral will be oversized on all ratings in order to be able to manage the combination of harmonics on the neutral wire when driving single-phase reference non-linear loads.

6.6 Overload

The inverter will be capable of supplying an overload of 125% for 10 minutes and 150% for one minute of the nominal power.

6.7 Inverter shutdown

In the event of an internal failure the inverter will be immediately shut down by the control unit. The UPS device or the parallel-operated UPS systems will continue to supply the load from the bypass supply without interruption, if it is within permissible limits.

6.8 Output voltage symmetry

The inverter will guarantee the symmetry of the output voltages at ±1% for balanced loads and ±3% for 100% unbalanced loads.

6.9 Phase displacement

The phase angle displacement between the three-phase voltages will be:

- 120° ± 1° for balanced loads
- 120° ± 3° for unbalanced loads (0, 0, 100%)

6.10 Short circuit

The inverter short circuit capacity of Trinergy for the first 10ms will be 300% for any short circuit configuration. After the first 10ms, it will limit the current to 150% for no longer than 5s and then it will shut down.

6.11 Automatic upgrade of inverter rated power

The inverter will automatically upgrade its power as a function of ambient and operating temperatures, as shown in Figure 8. In the most common conditions (25°C) Trinergy will provide 10% more power than nominal. In these conditions the battery charge will be reduced in correspondence. The limit of the active power available at the output of the UPS is nevertheless obtained considering the nominal apparent power with output PF 1.

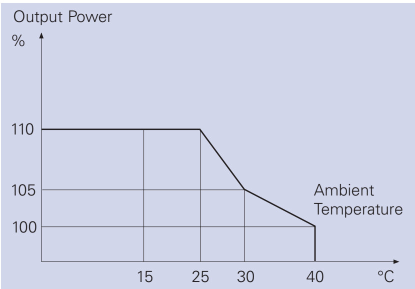

Figure 8. Automatic power upgrade.

6.12 Symmetrical Power Factor Output Diagram

The full IGBT inverter is able to supply, without derating, all kinds of loads (leading and lagging) with a Power Factor up to 1. This behavior is achieved thanks to the perfect dimensioning of all components of the output stage, which allows the obtaining of a Power Factor output diagram perfectly symmetrical respect to zero. Thanks to this feature, which is unique in the market, Trinergy offers maximum flexibility and compatibility with each installation and means that the customer doesn't have to worry about future modifications of the loads with a different Power Factor. As shown in Figure 9, it is clearly evident from the two blue areas that every kind of load (leading or lagging) with PF up to 1 will be supplied by the UPS without any derating since the inverter will be able to work at 100% of its power.

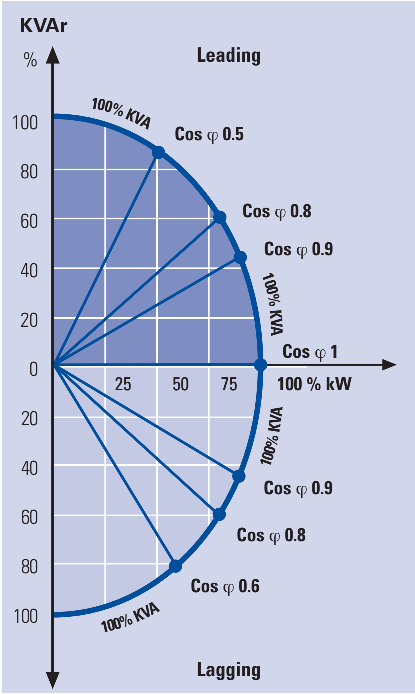

Figure 9. Power Factor Output Diagram.

6.13 Active Filtering Capacity in VI mode

The DC/AC IGBT inverter by means of the digital signal processor (DSP) of the control unit will be controlled so that it can operate as series and parallel active filter if this allows a higher efficiency level to be achieved.

Inverter as a parallel active filter: the inverter will work as a current controlled generator, generating a current that compensates the reactive and harmonic content of the load.

Inverter as a series active filter: the current of the active filter will have a shape intended to compensate the bypass line voltage in order to be able to remain inside the tolerance limits. This is possible by operating together with the Power Interface containing a series inductance that will serve one main purpose; that of adding a small line impedance for the active voltage compensation by interacting with the current of the active filter generated by the inverter.

7 Power Interface/Electronic Static Switch (Bypass)

7.1 General

The Power Interface is made up of a bypass static transfer switch with an upstream choke. This interface will power the load whenever the load and network conditions allow it to be able to take advantage of the Maximum Energy Saving mode (VFD) and the High Efficiency & Power Conditioning mode (VI). In interactive mode the inverter is able to operate as series active filter together with the Power Interface to compensate small out of tolerance.

The bypass static switch will be a fully rated, high speed, solid-state transfer device rated for continuous duty operation.

The following transfer and retransfer operations will be provided by the electronic static switch:

- Uninterrupted automatic transfer to the bypass supply in the event of:
  -inverter output overload
  -battery voltage outside limits in backup mode
  -over-temperature
  -inverter failure

- If inverter and bypass supply are not synchronised at the time of a necessary transfer, a switching delay can be set to protect the critical load. This prevents possible damage to the load by unintentional phase shift (a delay of 20ms is the preset standard value).

- Uninterrupted manual transfer/retransfer to and from the bypass supply will be initiated from the control panel.

- Uninterrupted automatic transfer/retransfer to and from the bypass supply by activation of the digital interactive mode.

- Uninterrupted automatic retransfer from the bypass supply, as soon as the inverter regains the capacity to supply the load.

- The uninterrupted transfer from the inverter to the bypass supply will be inhibited in the following situations:
  -bypass supply voltage outside limits
  -failure of electronic bypass switch

- The uninterrupted automatic retransfer may be inhibited in the following situations:
  -manual switching to bypass supply via the maintenance switch
  -UPS output overload
  -frequency converter.

7.1.1 Voltage

The default voltage of the bypass line will be 230/400 V RMS. Any transfer from inverter to bypass line will be inhibited if the voltage is beyond a limit of ±10% (standard setting) of the nominal voltage.

7.1.2 Transfer time (double conversion)

The switching time for a transfer from the inverter to the bypass supply or vice versa will be less than 0.5ms when synchronised. The system will ensure that the inverter is stable and operating normally before permitting a retransfer of the load back to inverter.
The transfer time when out of synchronisation will be defined by a preset parameter to prevent damage to the load by phase reversal.

7.1.3 Overload

The bypass static switch will be capable of supporting the following overloads:

125%	for	10 minutes
150%	for	1 minute
700%	for	600 milliseconds
1000%	for	100 milliseconds

7.2 Backfeed protection

When the UPS bypass input line is powered off, there is normally no dangerous voltage/current/power present on the UPS bypass input. However, when there is a fault in the bypass static switch there is the risk that electric power will appear on the UPS bypass input terminals. In this case the inverter powers the critical load and the upstream input power line.
This unexpected potentially dangerous power can propagate in the upstream distribution through the faulty bypass line. Backfeed protection is a safety device which prevents any potential risk from electric shock on the UPS bypass input AC terminals, in the event of a failure of the bypass static switch SCR. The control circuit will include a contact (available for the user) which activates an external isolating device, such as an electromechanical relay or a tripping coil, upon backfeed detection. In compliance with IEC/EN 62040-1-1, the isolating device is not included in the UPS. The external isolating device will be a 4 pole (three phases plus neutral) air gap isolator and will be defined according to clause 5.1.4 of the previously cited standard.

8 Functioning Modes

Trinergy incorporates the three existing standard topologies in one transformer-free UPS:

- **Maximum Power Control mode (IEC 62040-3 VFI):** is the double conversion mode which provides the highest level of power conditioning. It protects the load from all types of electrical network disturbances using a greater amount of energy. Efficiency at full load with the latest transformer free technology is over 95%.

- **Maximum Energy Saving mode (IEC 62040-3 VFD):** this mode detects when the need for conditioning is non-existent and allows energy flow to pass through the bypass line. In this case efficiency reaches 99%.

- **High Efficiency & Power Conditioning mode (IEC 62040-3 VI):** compensates only the main disturbances such as the load THDi, the load PF and main sags and swells. The energy used is derived from the use of the inverter as an active filter giving all the necessary reactive power. In a typical condition this mode will have an efficiency of between 96 and 98%, depending on the load type (e.g. non linear, linear etc.) and the input mains conditions.

The precise control of Trinergy allows it to quickly and seamlessly activate one of the three different functioning modes in order to accomplish the efficiency and effectiveness of each of the standard configurations. At the same time, Trinergy continues to maintain the performance and power protection of a Class 1 (IEC 62040-3) UPS for the load and perfect input power conditioning for the upstream distribution.

The activation of one of the three different functioning modes is based on real time power tracking of the main parameters related to the input network and to the output load.
(For any further detail on how the UPS select the functioning mode to be activated please refer to the application note "UPS Functioning Modes")
If the observed variables listed below are outside the ranges described the UPS will activate a different functioning mode. Parameters can be modified by the service engineer upon request. These conditions refer to full output load.

8.1 Double Conversion Mode (VFI)

8.1.1 Normal (VFI)

The UPS inverter continuously supplies the critical AC load. The rectifier derives power from the commercial AC source and converts it into DC power for the inverter and the battery charger. The battery charger keeps the battery in a fully charged and optimum operational condition. The inverter converts the DC power into clean and regulated AC power which is supplied to the critical load (conditioned line) and is synchronised with the bypass supply frequency. This ensures that any automatic transfer to the bypass supply (due to an overload etc.) is frequency synchronised and does not cause interruption to the critical load.

8.1.2 Overload (VFI)

In the event of an inverter overload, manual stop or failure, the static switch will automatically transfer the critical load to the bypass line without interruption.

8.1.3 Emergency (VFI)

Upon failure or reduction of the commercial AC source (see section 12) the inverter will supply the critical load, drawing power from the associated battery through the battery booster. There will be no interruption to the critical load upon failure, reduction or restoration of the commercial AC source. While the UPS is powered by the batteries, indications will be provided of actual autonomy time remaining as well as the duration of the mains failure.

8.1.4 Recharge (VFI)

Upon restoration of the commercial AC source, even in the case that the batteries are completely discharged, the rectifier will restart automatically (walk in) and gradually take over both the inverter and battery charger. This function will be fully automatic and will cause no interruption to the critical load.

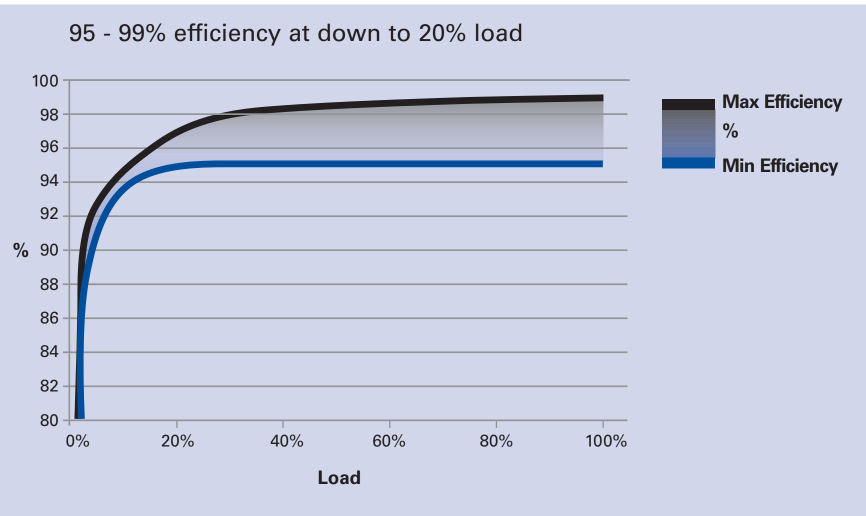

Figure 10. Trinergy efficiency values using circular redundancy.

8 Functioning Modes

8.2 Maximum Energy Saving mode (VFD)

This operational mode allows significant energy savings by increasing the overall AC/AC efficiency of the UPS up to 99%.

8.2.1 Normal (VFD)

The operating mode will depend on the quality of the mains supply in the short-term past and on the electrical characteristic of the load. If the line quality remains within permitted tolerance parameters in this timeframe, the direct line will provide continuous supply to the critical AC load through the power interface. The IGBT inverter control will remain in constant synchronisation with the direct line without driving the IGBT. This ensures that the load can be transferred to the conditioned line without any break in supply where there is a deviation from the selected input power tolerance levels. If the direct line failure rate has been outside permitted parameters in this timeframe, Trinergy will supply the load from the conditioned line. The battery charger supplies the energy necessary for maintaining maximum charge to the battery.

8.2.2 Transfer to VFI Emergency (due to mains supply failure or variance beyond tolerance limits)

If Trinergy is supplying the load via the direct line and the bypass mains supply varies beyond tolerance levels (adjustable using the software), the load will be transferred from the direct line to the conditioned line. The load is powered from the mains via the rectifier and inverter, (provided the input mains remains within the tolerances stated in chapter 12). Should the input mains fall below the lowest limit, the batteries will be used to power the load via the inverter.

8.2.3 Return to VFD

When the mains supply returns to within tolerance limits, Trinergy will continue to supply the load via the conditioned line for a period of time dependant on the direct line failure rate (the conditioned line draws power from the mains not the battery).
When the direct line has stabilised, Trinergy returns to normal operation. The battery charger automatically begins to recharge the battery so that maximum autonomy is guaranteed in the shortest possible time.

8.3 High Efficiency & Power Conditioning mode (VI)

This functioning mode allows significant energy savings by operating with a typical efficiency between 96% and 98% while providing power conditioning to the load.

8.3.1 Normal (VI)

The operating mode will depend on the quality of the mains supply in the short-term past and on the electrical characteristic of the load.

If, the line quality remains within permitted tolerance parameters and the load needs power conditioning, (THDi, THDv, PF) the power interface will provide continuous supply to the critical AC load while the inverter operates as series and parallel active filter.
The IGBT inverter will be able to compensate the power factor of the load, the current harmonic distortion and the voltage harmonic distortion guaranteeing optimum power conditioning to the load while maintaining the highest level of efficiency.

8.3.2 Transfer to VFI Emergency (due to mains supply failure or variance beyond tolerance limits)

If the bypass mains supply varies beyond tolerance levels (adjustable using the software) that cannot be compensated through the active filter, the load will be transferred from the direct line to the conditioned line. The load is powered from the mains via the rectifier and inverter, (provided the input mains remains within the tolerances stated in section 12). Should the input mains fall below the lowest limit, the batteries will be used to power the load via the inverter.

8.3.3 Return to VI

When the mains supply returns within tolerance limits, Trinergy will continue to supply the load via the conditioned line for a period of time dependant on the direct line failure rate (the conditioned line draws power from the mains not the battery). When the direct line has stabilised, Trinergy returns to normal VI operation. The battery charger automatically begins to recharge the battery so that maximum autonomy is guaranteed in the shortest possible time.

For further details on the activation of the three different functioning modes refer to Chloride functioning modes application note.

9 Monitoring and Control, Interfaces

9.1 General

The UPS will incorporate the necessary controls, instruments and indicators to allow the operator to monitor the system status and performance, and take action where appropriate. Furthermore, interfaces allowing extended monitoring and control, in addition to service functions, will be available.

9.2 LCD Touch Screen display

Trinergy features a standard LCD touch screen display, allowing for easy interaction with the UPS. A high level of security is provided for both, users and service engineers via two separate password access privilege levels.

Intelligent operation

- Monitors user-defined thresholds for load power margin and phase imbalance
- Logs data and event histories regarding power, load, battery, and other system conditions

Information tracking

- Overall system and module readiness, with informational, warning and critical status indicators
- Module level alerts for all major subsystems including rectifier, inverter, batteries, static switch, and bypass
- Power path status via animated single-line mimic display
- System voltages and power — input, output and bypass, all phases
- Load vs. capacity indicator
- Load phase balance indicator
- System temperature gauge
- Battery charge indicator
- Service history logs—module and battery

A single-line diagram of the UPS is continuously displayed on the default page. The main functional blocks and power paths of the UPS are displayed using simple universal technical symbols, instantly communicating the overall status of the UPS.

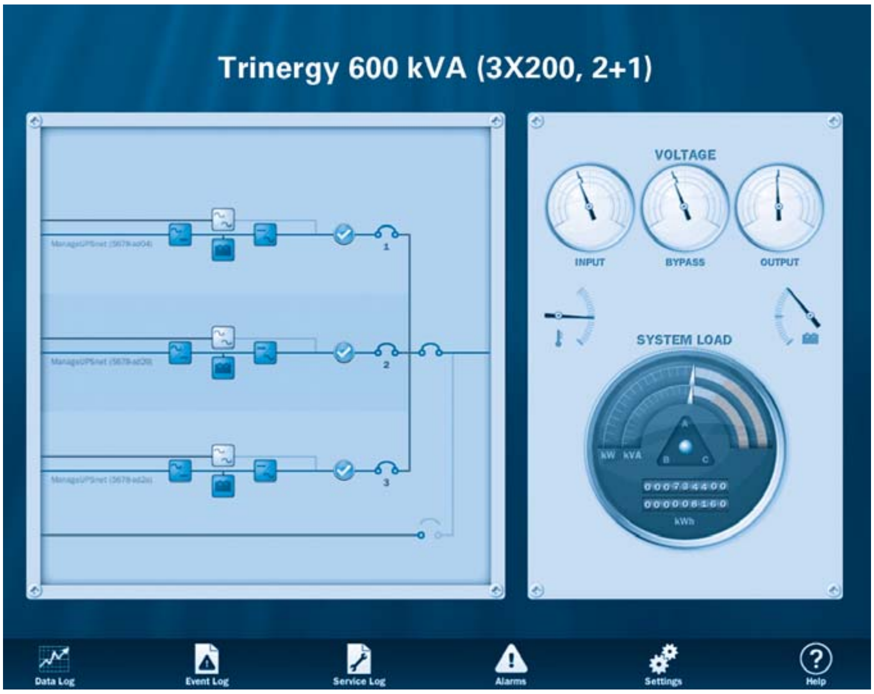

Figure 11. LCD Touch Screen display.

The same screen also permanently displays the output load percentage measurement in dashboard style (one for each output phase). In the event that the UPS is not in normal functioning mode, it is possible to access the "Warning and Alarm" summary page directly from the default page. Warnings and alarms will be identified by text strings and codes. In battery operation, the display will switch between warning code and estimated backup time in minutes.

After 30 seconds of inactivity (i.e. no contact with screen/buttons) the display reverts to the screen saver page which shows the status of the UPS (Normal, Warning, Alarm).

The text displayed by the LCD will be available in 15 languages: English, Italian, French, German, Spanish, Portuguese, Turkish, Polish, Swedish, Norwegian, Finnish, Czech, Russian, Arabic, Chinese, all selectable by the user.

For further details please refer to the User Manual.

9.3 Start and Stop inverter

The Start and Stop push buttons are integrated in the LCD touch screen display.

The control will incorporate a safety feature to prevent inadvertent operation yet still allow for rapid shutdown in the event of an emergency. To stop the inverter the user must press and hold the Stop button for a few seconds. An audio alarm will be activated during this delay time.

9.4 Interface

9.4.1 Ethernet RJ45 Interface (X9)

Trinergy will be equipped with a RJ45 Ethernet interface.
This interface is a 10/100 MBit autonegotiation full/half duplex RJ45 Ethernet interface for LAN communication with service software PPVis. It allows the setup of UPS parameters during commissioning and maintenance.

9 Monitoring and Control, Interfaces

9.4.2 RS232 Service port (X3)

Trinergy will be equipped with one D type female connector (9 pin) for serial RS232 communication for service purposes only.

9.4.3 LIFE.net (X6)

The service Interface is a SUB-D 9 pin male connector for RS232 serial communication.

Trinergy includes an XS6 connection for the LIFE.net slot modem. If this slot modem is not installed, this port may be used for an external LIFE.net kit (e.g. LIFE over IP, GSM).

9.4.4 Slot card bay (XS3 & XS6)

Trinergy will be equipped with two slot bays available for communication card options. One of the slots (XS6) will be available for the LIFE.net slot modem. The other slot (XS3) will be available for connectivity options, such as ManageUPS NET III adapter. Please refer to Chloride Connectivity Solutions for further details about the available slot expansion cards.

9.5 2*16 Pole screw connector for input and output contacts (TB1)

This 2*16-pole screw connector allows the connection of: six individual configurable output and four individual configurable input contacts which can be programmed via PPVis (service software tool) for a wide range of functions. This interface is SELV-isolated from the UPS primary circuits. The maximum rating of the output contacts must not exceed 24V and 1A (refer to the User Manual for further details).

Output Contacts (lower row of the connector):

PIN	Status	Preset Value
PIN 1 (left)	Normally closed	Summary Alarm
PIN 2	Normally open	
PIN 3	Normally closed	Bypass Active
PIN 4	Normally open	
PIN 5	Normally closed	Low Battery
PIN 6	Normally open	Normally open
PIN 7	Normally closed	AC Fail
PIN 8	Normally open	
PIN 9	Common to PIN1-PIN8	N/A
PIN 10	N/A	N/A
PIN 11	Normally closed	Selectable
PIN 12	Normally open	
PIN 13	Common to PIN11-PIN12	N/A
PIN 14	Normally closed	Selectable
PIN 15	Normally open	
PIN 16	Common to PIN14-PIN15	N/A

The Interface is SELV - isolated from UPS primary circuits.

9 Monitoring and Control, Interfaces

Input Contacts (upper row of the connector):

PIN	Status	Preset Value
PIN 1 (left)	Input 1 (24VDC OUT)	Selectable
PIN 2	Input 1 (24VDC signal)	
PIN 3	Input 2 (24VDC OUT)	Selectable
PIN 4	Input 2 (24VDC signal)	
PIN 5	Input 3 (24VDC OUT)	Selectable
PIN 6	Input 3 (24VDC signal)	
PIN 7	Input 4 (24VDC OUT)	Selectable
PIN 8	Input 4 (24VDC signal)	
PIN 9 - 16	N/A	N/A

The Interface is SELV - isolated from UPS primary circuits.

9.6 LIFE.net

In order to increase the overall reliability of Trinergy system, the LIFE.net communication kit, providing connection to Chloride's LIFE.net diagnostic service will be available. LIFE.net will allow the remote diagnosis of the UPS through the IP connection (Internet connection), telephone lines or GSM link in order to ensure maximum reliability of the UPS throughout its operational life. The monitoring will be a real 24-hour, 365 day service thanks to a unique feature that allows trained Service Engineers to remain in constant electronic contact with the service centre, and therefore the UPS. The UPS will automatically dial-up the service centre at defined intervals to provide detailed information that will be analysed in order to predict potential short-term future problems. In addition, it will be possible to control the UPS remotely.

The communication of UPS data to the Chloride LIFE Command Centre will be transmitted via the integrated modem at the following intervals:

- ROUTINE: settable at intervals of between five minutes and two days (typically once a day)
- EMERGENCY: when a problem occurs or parameters are beyond tolerance limits
- MANUAL: following a request from the command centre

During the call the command centre will:

- Identify the UPS connected
- Request the data stored in the UPS memory since the last connection
- Request real-time information from the UPS (selectable)

The service centre will analyse historical data and issue a regular detailed report to the customer informing them of the UPS operational condition and any critical states.
The LIFE.net centre allows the possibility of activating the LIFE-SMS delivery system option, where the customer may receive SMS notification which will be activated in the event of one of the following:

- Mains power failure
- Mains power recovery
- Bypass line failure
- Load supplied by reserve.

10 Mechanical Data

10.1 Enclosure

The UPS will be housed in a space-saving modular enclosure with front doors and removable panels (protection as per IP 20 standard). The enclosure will be made of zintec coated sheet steel and the doors will be lockable. Different degrees of IP protection are available on request.

10.2 Ventilation

Forced redundant air cooling will ensure that all the components are operated within their specification. Airflow will be controlled according to load demand. The UPS will be immediately notified of the fan failure condition via all the user interfaces and through the LIFE.net service. The cooling air entry will be on the front and the air exit at the top of the device. The enclosure will be installed with at least 500 mm of free space between the device and roof of the enclosure in order to allow unhindered exit of cooling air.

10.3 Cable entry

Cable entry will be available as standard from the BOTTOM or from the TOP of the central I/O Box.

10.4 Enclosure design

All surfaces of the enclosure will be finished with an electrostatically applied epoxy coat. The coating will have a thickness of at least 60 microns. The standard colour of the enclosure will be RAL 5004.

10.5 Access to integrated subassemblies

All internal subassemblies will be accessible from the front of the unit via hinged doors to allow for ease of maintenance. Rear access will not be required for installation or servicing.

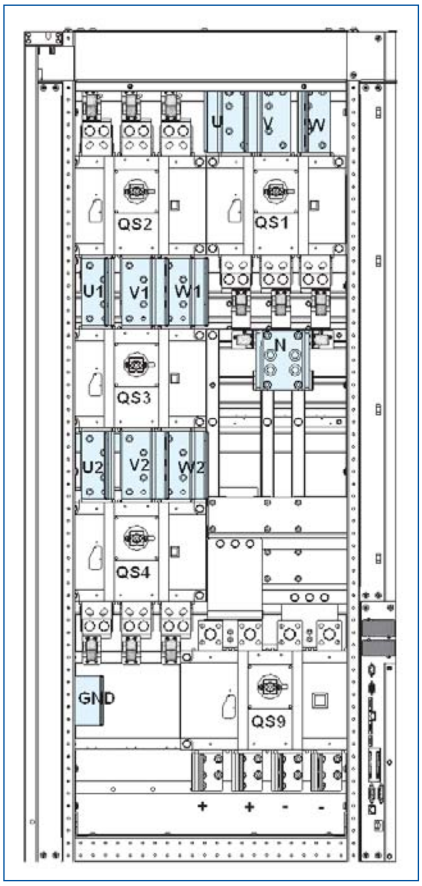

Figure 12. I/O Box showing power connection bars.

11 Environmental Conditions

The UPS will be capable of withstanding any combination of the environmental conditions listed below. It will operate without mechanical or electrical damage or degradation of operating characteristics.

11.1 Ambient temperature

0° to 40°C
Maximum daily temperature (24 hr) 40°C.

11.2 Relative humidity

Up to 95% (non condensing) for temperature of 20°C.

11.3 Altitude

The maximum altitude without derating will be 1000 metres above sea level (for higher

12 Technical Data (400 to 1200 kVA)

UPS Unit		400	600	800	1000	1200
Primary input						
Nominal voltage[1]	(V)	400 (3Ph + N[1])				
Voltage range	(V)	340 to 460				
Minimum voltage without battery discharge[10]	(V)	250				
Nominal frequency	(Hz)	50 (60 selectable)				
Frequency range	(Hz)	± 10%				
Power factor @ nominal load & nominal input conditions[2]		≥ 0.99				
Input current distortion @ nominal input conditions[2] & nominal output power[3]	(%)	<3				
Walk in/Soft start (seconds)		10 (1 to 90 selectable)				
Rectifier Hold-Off (seconds)		1 (1 to 180 selectable)				
Inrush current/Imax input[4]		≤1				
AC/DC rectifier efficiency without charging current @ nominal input conditions[2] with resistive load:						
- Half load[7] ≥ (%)		97.6	97.8	97.8	97.8	97.8
- Full load[7] ≥ (%)		97.5	97.7	97.7	97.7	97.7
BATTERY						
Permissible battery voltage range	(V)	396 to 700				
Recommended no. of cells:						
- VRLA[5]		240				
- WET		240				
- NiCd		375				
Float voltage for VRLA @ 20°C[6]	(V/cell)	2.27				
End cell voltage for VRLA	(V/cell)	1.65				
Float voltage temperature compensation		-0.11% per °C				
DC ripple current in float mode for a 10 min autonomy as per VDE0510[5]		<0.05C10				
Float Voltage stability in steady state condition	(%)	≤1				
DC ripple voltage without battery	(%)	≤1				
Optimum battery temperature	(°C)	15 to 25				
Maximum Battery recharge current for 240 cells @ 400V input voltage & nominal load	(A)	140	210	280	350	420
Battery output power in discharge mode with nominal output load	(kW)	377	565	754	942	1130
End battery voltage for 240 cells	(V)	396				
End battery current for 240 cells with nominal output load.	(A)	475.7	951.4	1427.1	1902.9	2378.6

12 Technical Data (400 to 1200 kVA)

UPS Unit		400	600	800	1000	1200
Inverter Output						
Apparent nominal power @ 40°C ambient	(kVA)	400	600	800	1000	1200
Apparent nominal output power @ 25°C ambient	(kVA)	440	660	880	1100	1320
Nominal active power	(kW)	360	540	720	900	1080
Nominal output current	(A)	580	870	1159	1449	1739
Maximum active power up to 100% of nominal apparent power[10]	(kW)	400	600	800	1000	1200
Overload at nominal output voltage for 10 minutes	(%)	125				
Overload at nominal output voltage for 1 minute	(%)	150				
Short circuit current for 10ms/ <5s	(%)	300/150				
Nominal output voltage	(V)	400 (380/415 selectable, 3ph+N)				
Nominal output frequency	(Hz)	50 (60 selectable)				
Voltage stability in steady state condition for input (AC & DC) variations and step load (0 to 100%)	(%)	±1				
Voltage stability in dynamic condition for input variation (AC & DC) and step load (0 to 100% and vice versa)	(%)	Complies with IEC/EN 62040-3, Class 1				
Voltage stability in steady state for 100% load imbalance (0, 0, 100)	(%)	±3				
Output frequency stability						
- synchronised with bypass mains	(%)	±1 (2, 3, 4 selectable)				
- synchronised with internal clock	(%)	±0.1				
Frequency slew rate	(Hz/sec)	<1				
Output voltage distortion with 100% linear load	(%)	<1				
Output voltage distortion @ reference non linear load as for IEC/EN 62040-3	(%)	<3				
Load crest factor handled without derating the ups	(Ipk/Irms)	3:1				
Phase angle precision with balanced loads	(degrees)	1				
Phase angle precision with 100% unbalanced loads	(degrees)	<3				
DC/AC Inverter efficiency @ nominal input conditions[2] with resistive load:						
- Half load[7] ≥ (%)		97.7				
- Full load[7] ≥ (%)		97.6				
Neutral conductor sizing		1.7 nominal current				
Output power upgrading with ambient temperature:						
- At 25°C (%)		110				
- At 30°C (%)		105				
- At 40°C (%)		100				

12 Technical Data (400 to 1200 kVA)

UPS Unit		**400**	**600**	**800**	**1000**	**1200**
Static bypass						
Nominal bypass voltage[1]	(V)	400 (380/415 selectable, 3ph+N)				
Nominal frequency	(Hz)	50/60 (selectable)				
Frequency range	(%)	±1 (2, 3, 4 selectable)				
Voltage range	(%)	±10				
Maximum overload capacity						
- For 10 minutes	(%)	125				
- For 1 minute	(%)	150				
- For 600 milliseconds	(%)	700				
- For 100 milliseconds	(%)	1000				
I^2t @ T_{vj}=125°C 8.3-10ms	(A^2s)	1280000	2880000	5120000	8000000	11520000
Transfer time with inverter synchronous to bypass:						
- Inverter to Bypass	(ms)	no break				
- Bypass to Inverter	(ms)	no break				
Transfer time with inverter not synchronous to Bypass	(ms)	<20				
System data						
AC/AC efficiency VFI mode @ nominal input conditions[2] with resistive load:						
- 25% load[7][8]	(%)	95	95.2	95.2	95.2	95.2
- 50% load[7][8]	(%)	95.4	95.6	95.6	95.6	95.6
- 75% load[7][8]	(%)	95.5	95.7	95.7	95.7	95.7
- 100% load[7][8]	(%)	95.2	95.5	95.5	95.5	95.5
AC/AC Efficiency VFD mode[7]	(%)	99				
Noise @ 1 metre as per ISO 3746	(dBA ± 2dBA)	71	73	74	75	76
Protection degree with open doors		IP20 (higher degree of protection available on request)				
Mechanical dimensions:						
- Height	(mm)	1780				
- Width	(mm)	1800	2775	3450	4450	5125
- Depth[9]	(mm)	860				
Frame colour	(RAL scale)	5004				
Weight	(kg)	1450	2370	3040	3890	4560
Cable entry		Top/Bottom				
Access		Front				
Cooling		Forced Ventilation with redundancy				

12 Technical Data (400 to 1200 kVA)

UPS Unit		400	600	800	1000	1200
Environmental						
Operating temperature[11]	(°C)	0 - 40				
Maximum relative humidity @ 20°C (non condensing)	(%)	up to 95				
Max altitude above sea level without derating	(m)	1000 (for higher altitudes complies with IEC/EN 62040-3)				

(1) In case of a split bypass configuration primary input and bypass mains must have a common earth. The neutral conductor could be part of the bypass or primary mains but it must be present.
(2) At nominal voltage, nominal frequency.
(3) With input voltage at nominal value and with THDv 1%.
(4) Imax input can be calculated using the maximum input power @400V in recharge mode.
(5) Permitted number of cells = 240 – 300. Special battery cabinet for more than 240 cells.
(6) There are several possible charging methods. Refer to chapter 5 for full description.
(7) For tolerance see IEC/EN 60146-1-1 or DIN VDE 0558.
(8) Efficiency referred to VFI mode with Circular Redundancy.
(9) Including front handle; without handle 830 mm.
(10) Conditions apply. For further details please contact technical support.
(11) Reccomended average daily ambient temperature 35°C with a maximum of 40°C for 8 hours as requested by 62040 standard.

General conditions for the Technical Data table:
The data shown are typical and not definable in other ways; furthermore the data refer to 25°C ambient temperature and PF= 1 where not specified.
Not all the data shown apply simultaneously and may be changed without prior warning.
Data apply to the standard version, if not otherwise specified.
If the options described in chapter 13 are added, the data shown in the Technical Data Table may vary. For test conditions and measurement tolerances not specified in the table refer to the Witness Test Report procedure.

13 Options

13.1 Isolation transformer

Trinergy can be customised to provide full galvanic isolation for specific load requirements by adding an external isolation transformer. For further detail please contact the technical support.

These options will provide the following benefits:

- Full galvanic isolation for medical and "most critical" applications
- Installation with two independent input sources with different neutrals
- Installation in distribution without neutral
- Voltage adaptation

13.2 Core Connection Kit

In order to add one power module to the existing configuration it is necessary to fit the copper bar present on the back of the unit which connects input output and bypass of the power module to the central I/O Box. Six different connection kits are available to suit the module(s) installed.
The interconnection kit for the first module to be connected to the left and to the right of the I/O Box also contains the side panel of the power module.

13.3 Parallel configurations

Trinergy can be connected with up to eight units in parallel, without the need for an additional parallel board, allowing maximum reliability and flexibility.
A single unit can be upgraded to a parallel one at any time through a parallel cable used for the communication between the UPS connected in parallel. One parallel cable kit is required for each unit to be paralleled.

13.4 Remote Display

A remote alarm panel will be available to display important messages from the individual UPS. Upon request, it will be possible to display up to eight UPS systems.

13 Options

13.6 Battery management modules (only upon request)

With measuring modules connected to the battery blocks, enhanced battery management will be possible offering the following features:

- Measurement of the condition of each individual battery block by means of separate battery measuring modules (BMM)
- Analysis of each battery block with measurement of the minimum and maximum voltage values.

13.7 Dust filters

This option will improve the protection degree of the air entrance from IP20 to IP40 for specific applications such as a dusty environment. The filter will be housed in the UPS cubicle (IP20).

13.8 Use as frequency converter

Trinergy may be programmed for use as a frequency converter (50Hz in - 60Hz out or 60Hz in -50Hz out) for operations with or without a battery bank connected.
In this operational mode, the data shown in the Technical Data table may vary (e.g. output overload capability). Please contact Chloride Technical Support for details.

13.9 MopUPS shutdown and monitoring software

The main function of MopUPS software will be the safe shutdown of the operating system in the event of a power failure. Other functions include:

1. Automatic communications for events; e-mail, SMS, etc.
2. File saving of event log and status information
3. Viewing and monitoring of UPS in real time
4. Programmed system shutdown
5. Remote monitoring of UPS connected to network server using Named Pipes or TCP/IP

13.10 ManageUPS adapter

This option will include a complete package (including slot card adapter) to ensure monitoring and control of the networked UPS through TCP/IP protocol. The adapter permits:

- UPS monitoring from NMS via SNMP
- UPS monitoring from PC via a Web browser
- Dispatch of e-mail messages on occurrence of events

ManageUPS, in conjunction with MopUPS, will also permit safe shutdown of the operating systems.

13.11 MODBUS RTU / JBUS and Environment Sensor

Two special versions of the ManageUPS NET adapter are available for Trinergy and include the following added options:

- The ManageUPS NET Adapter + B series which provides an open approach to the management of the network power. ManageUPS + B simplifies the integration of Chloride UPS systems with Building Monitoring and Automation Systems via MODBUS RTU, MODBUS/TCP or JBUS protocols.

- ManageUPS NET Adapter + E model includes the auxiliary Blue Bus connector, one (1) Environment Sensor module and a five-meter Blue Bus cable. The Environment Sensor measures the ambient temperature and relative humidity (RH), reads three (3) volt-free relay input contacts and controls one (1) output relay for event response. It is also possible to add a cascade of up to 16 additional sensor modules to monitor multiple zones from one UPS network adapter. Flexible "Any or All" logic allows you to pick multiple event triggers to drive the output relay control.

Appendix: Planning and Installation

Installation site

Pay attention to the following conditions when selecting an installation site:

- This UPS must only be installed in closed operating areas. If the area houses, any equipment containing in excess of 25 litres of inflammable fluids, refer to HD 384.4.42 S1 A2, chapter 42 (corresponds to DIN VDE 0100, Part 420), it must be ensured that flammable fluids and or combustive products cannot spread through the building.
- The ambient temperature should be between 0°C and +40°C for UPS devices. Continuous operation at temperatures up to a maximum of +50°C, reduces the max. load by 12% of the nominal load per 5°C.
- The ambient temperature should be between +15°C and +25°C for batterycabinets.
- Be sure to provide sufficient cooling of the installation room so that the ambient temperature remains within the stated limits. The heat emission ratings of the UPS are given in the Technical Data tables. Be sure also to provide sufficient ventilation for the type of batteries used in the UPS.
- When operating the Trinergy UPS at altitudes over 1000m a.s.l., the load must be reduced accordingly (see User Handbook). If the ambient temperature remains less than +30°C, no load reduction is necessary for altitudes up to 2000m.
- Ensure that the load carrying capacity of the floor is sufficient for the UPS and batteries. The floor must be even and level.

Avoid harmful agents such as:

- Vibration, dust, corrosive atmospheres and high humidity

Allow the following min. distances:

- 500 mm between the top of the cabinet and the roof
- No wall-distance is required, unless the cables are routed from above, in which case the wall-distance must be at least equal to the bending radius of the cables in use. The distance between covering parts and floor is 150 mm.
- No limits on either side of device.

Notes

Chloride Systems
WORLD HEADQUARTERS
Via Fornace 30
40023 Castel Guelfo (BO)
Italy

T +39 0542 632 111
F +39 0542 632 120
E enquiries@chloridepower.com

CHLORIDE

www.chloridepower.com

Chloride operates through a worldwide network of Chloride sales and service offices and joint ventures, with operations across 80 countries including:

Almaty, Kazakhstan
Bangkok, Thailand
Beijing, China
Makati City, Philippines
Bologna, Italy
Buenos Aires, Argentina
Chicago, USA
Dubai, UAE
Erlangen, Germany
Ho Chi Minh City, Vietnam
Lisbon, Portugal
Istanbul, Turkey
Madrid, Spain
Moscow, Russia
Paris, France
Pune, India
Diadema, Brazil
Shanghai, China
Singapore
Southampton, UK
Sydney, Australia
Warsaw, Poland

Chloride Australia
Ground Floor, 16 Giffnock Avenue
North Ryde
NSW 2113
Australia

T +61 2 9888 1266
F +61 2 9888 1966
E australia.sales@chloridepower.com

www.chloridepower.com.au

Chloride Middle East
Arenco Tower, Office 608
Dubai Internet City - Dubai
UAE
PO Box 72536

T +971 4 434 5201
F +971 4 430 8032
E middleeast.sales@chloridepower.com

www.chloridepower.com/middle-east

Chloride Secure Power Philippines, Inc.
28th Floor, Tower 2, The Enterprise Center
6766 Ayala Avenue corner Paseo de Roxas
Makati City 1226
Philippines

T +632 849 3895
F +632 886 5008
E philippines.sales@chloridepower.com

www.chloridepower.com

CHLD Singapore Pte Ltd
2 Corporation Road
#03-07 Corporation Place
Singapore
618494

T +65 6481 4776
F +65 6481 0552
E singapore.sales@chloridepower.com

www.chloridepower.com.sg

Chloride Vietnam
Unit 1708, 17th Floor, Gemadept Tower
06 Le Thanh Ton Street
Ben Nghe Ward, District 1
Ho Chi Minh City
Vietnam

T +84 8 255 6737
F +84 8 255 6800

www.chloridepower.com/vn

Chloride UK
George Curl Way
Southampton
Hampshire, SO18 2RY
United Kingdom

T +44 (0) 23 8061 0311
F +44 (0) 23 8061 0852
E uk.enquiries@chloridepower.com

www.chloridepower.co.uk

Chloride North America
27944 North Bradley Road
Libertyville, IL 60048
USA

T +1 847 816 6000
+1 800 327 8801
F +1 847 680 5124
E usa.info@chloridepower.com

www.chloridepower.com/usa

Chloride Power Protection Limited
1093/98-99 M. 12 Central City Tower 1
18th floor, Bangna-Trad Road (K.M.3)
Bangna, Bangkok 10260
Thailand

T +66 2762 3600
F +66 2745 6618
E thailand.sales@chloridepower.com

www.chloridepower.com/th

For a full list of contacts please visit our website at **www.chloridepower.com**

MKA4CATOUKTRIN

GOST certification

PRODUCT SERVICE

Certificate No. EMS 76732

Certificate No. FM 11043